Journal of Korean Nature Vol. 3, No. 2 77-81, 2010

Bird Community of Tandong Stream in Daejeon Metropolitan City

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Abstract: This study carried out over two times in February and May in 2009 was aimed at the survey of the birds inhabiting in the whole region of Tandongcheon (Stream) that runs through Daedeok Science Town in Daejeon Metropolitan city to Gapcheon (Stream) and the adjacent area such as Maebongsan and Seongdusan urban parks. The number of birds observed during the period reached 11 orders, 23 families, 37 species, and 799 individuals (Total sum of maximum individuals). The highest dominant species was *Anas crecca* that was counted in 153 individuals (19.15%), while the others were *Paradoxornis webbianus* in 125 individuals (15.64%), *Pica pica* in 101 individuals (12.64%), *Passer montanus* in 91 individuals (11.39%), *Anas poecilorhyncha* in 66 individuals (8.26%), and *Hypsipetes amaurotis* in 41 individuals (5.13%). By seasons, 28 species 742 individuals were observed in winter while 24 species 337 individuals in spring. Especially it was notable that *Amaurornis phoenicurus* was observed in winter (February), which is known as a passage migrant not easily seen in Korea. In addition, the legally protected species designated as Korean National Monument in Korea such as *Falco tinnunculus*, *Otus scops*, and *Ninox scutulata* were observed, too.

Key words: Bird Community, Dominant Species, Legally Protected Species, *Amaurornis phoenicurus*

Introduction

The urban area is highly exposed to disturbance and environmental change (Gilbert, 1989; Rebele, 1994). Urban ecosystem can be defined as a system where the materials flow between biological fragments such as forest, stream, street tree, etc. and non-biological fragments such as road, residential area, etc. In this landscape, the birds move through the fragments such as stream, street tree, etc. (Marzluff and Restani, 1999). Before the 1960s, the habitats for many species of birds, animals, and plants such as natural stream, farm land, and forest tended to be connected one another, but rapid industrialization and urbanization accelerated human-oriented development of the streams in downtown, which resulted in the reinforcement of flood control function but the reduction in ecological function such as the occurrence of dry stream, interruption of habitat, unbalance of ecosystem, etc. (Lee, 2001; Ministry of Environment, 2002; Kim *et al.*, 2010). In Daejeon Metropolitan City, branch streams of the Geumgang River such as Gapcheon (Stream), Yudeungcheon (Stream), and Daejeoncheon (Stream) run through the heart of the city. Gapcheon that rises in the Mt. Daedun is watered by 8 branch streams including Yudeungcheon, Tandongcheon (Stream), etc.. Tandongcheon that rises in the Mt. Geumbyeong runs into the Gapcheon through Jaundae, Daedeok Science Town, and National Science Museum, which belongs to the Regional 2nd Class River with its flow path length in 8.75 km and estuary area in 20.77 km (Daejeon Metropolitan City, 2003; Kim, 2008). Located within Daedeok Science Town in Daejeon, Tandongcheon is narrow where flows not a large amount of water, but the stream side is full of aquatic plants such as reeds, etc., and some part of the area still maintains a certain form of natural stream. In addition, Maebongsan and Seongdusan designated as urban parks are located in the adjacent area.

With regard to the previous study on birds distribution and community in the key streams of Daejeon such as Gapcheon, Yudeungcheon, Daejeoncheon, etc., there have been the reports such as Lee *et al*. (2002) focused on avifauna on Gapcheon, and Kim *et al.* (2010) focused on bird community and similarity in three streams in Daejeon Metropolitan City, but rare report on the birds inhabiting in Tandongcheon. Therefore, this study is aimed at the observation of avifauna inhabiting in the whole region of Tandongcheon and using the resultant information as the basic data for protecting and managing the ecosystem of Tandongcheon.

Study Area and Method

This study was carried out over two times on February 24, 2009 (1st) and May 6, 2009 (2nd) respectively against Tandongcheon that runs through Daedeok Science Town in Daejeon Metropolitan city to Gapcheon and the adjacent

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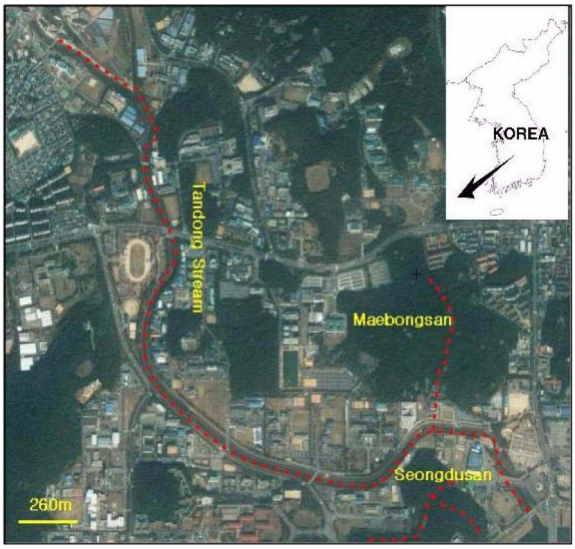

Fig. 1. Map of study area (····· survey routes).

area such as Maebongsan and Seongdusan urban parks (Fig. 1).

For the method of observation, the researcher moved along Tandongcheon using vehicle and by walk recording the name of species and the number of individuals by identifying the species with their flying style and sound, etc. after observing the birds that occur with the naked eye, binoculars (10×40) through Line Transect Method (Bibby *et al*., 1992). In addition, the researcher recorded the location of the birds that occurred using GPS (Garmin, GPSmap 60CS), and photographed them with a camera (Nikon D300) with telephoto lens (AF VR-NIKKOR 80~400 mm) attached to.

The aggregation of the observation results was summarized in accordance with the Birds of Korea (Lee *et al*., 2000), for which, Won (1981)'s Illustrated Encylclopedia of Fauna & Flora of Korea, Vol. 25 Fauna (Ecosystem of Birds), Korean National Monuments of Korea (Yoon *et al*., 1998), and Endangered Fauna & Flora of Korea and Legally Protected Species in Korea (Won and Yoon, 1998) were also referred to.

The formula used in the analysis of the observation results is as follow (Brower *et al*., 1990; Shannon and Weaver, 1949; Margalef, 1963).

Dominance

$$\text{Dom. (\%)} = \frac{ni}{N} \times 100$$

ni: Number of Individuals at **i** species
N: Total number of birds in the study site

Species Diversity

$$H' = -\Sigma(ni/N) \times \ln(ni/N)$$

Results and Discussion

Avifauna

The birds observed in the whole region of Tandongcheon during the period were 11 orders, 23 families, 37 species, and 799 individuals in total, a majority of which were the resident birds counted in 25 species (67.6%), and the others such as winter birds in 6 species (16.2%), summer birds in 4 species (10.8%), and passage migrant in 2 species (5.4%) (Table 1).

In their study on three big streams in Daejeon, Lee *et al.* (2002) conducted from September 2001 to August 2002 reported to have found 83 species and 15,900 individuals in total with the species diversity in 2.68 for the birds inhabiting on Gapcheon, while Kim *et al*. (2010) reported to have found 114 species and 14,885 individuals with the species diversity in 2.72 from Gapcheon, 90 species and 6,642 individuals with the species diversity in 2.55 from Yudeungcheon, and 69 species and 4,202 individuals with the species diversity in 2.26 from Daejeoncheon through their study conducted for three years concerning the three key streams in Daejeon. This study cannot be compared at the same level as the period of this study was limited to two times only and the scale of stream was too small, but the species diversity was 2.66 representing the same level as that of three key streams.

The highest dominant species was *Anas crecca* counted in 153 individuals (19.15%), and the others were *Paradoxornis webbianus* in 125 individuals (15.64%), *Pica pica* in 101 individuals (12.64%), *Passer montanus* in 91 individuals (11.39%), *Anas poecilorhyncha* in 66 individuals (8.26%), and *Hypsipetes amaurotis* in 41 individuals (5.13%) in order. Most of the birds were *Anas crecca* that were small ducks that move through waterside along the stream and the birds inhabiting in the pasture on the forest which prefer to pasture, bush, shrub, farm land, etc. Ducks occupied approx. 29% of total. On the other hand, woodpecker or tits etc. were observed on Seongdusan and Maebongsan urban parks near Tandongcheon. (Fig. 2).

Actual states by times

The birds observed in the 1st phase (Feb. 2009) that was the winter season were 28 species 742 individuals, the highest dominant species of which was *Anas crecca* (20.61%) that is the winter birds. The others were *Paradoxornis webbianus* (16.85%), *Pica pica* (13.61%), *Passer montanus* (12.26%), *Anas poecilorhyncha* (8.89%) in order (Table 2). With regard to the subject area, the largest number of species and individuals were found in Tandongcheon (A) (21 species and 567 individuals) while the smallest was found in Maebongsan urban park (C) (10 species and 51 individuals). In the meantime, species diversity was found the highest

Table 1. List of birds observed on the Tandong stream in Daejeon metropolitan city, Korea

No.	Scientific name	Korean name	1st	2nd	Peak count	Dom. (%)	Mig.
1	*Podiceps ruficollis*	논병아리	2		2	0.25	Res
2	*Ardea cinerea*	왜가리		1	1	0.13	Res
3	*Egretta garzetta*	쇠백로	2		2	0.25	Res
4	*Anas crecca*	쇠오리	153		153	19.15	WV
5	*Anas platyrhynchos*	청둥오리	15		15	1.88	WV
6	*Anas poecilorhyncha*	흰뺨검둥오리	66	34	66	8.26	Res
7	*Falco tinnunculus*	황조롱이	1	1	1	0.13	Res
8	*Phasianus colchicus*	꿩	1	9	9	1.13	Res
9	*Amaurornis phoenicurus*	흰배뜸부기	1		1	0.13	PM
10	*Streptopelia orientalis*	멧비둘기	4	6	6	0.75	Res
11	*Cuculus canorus*	뻐꾸기		3	3	0.38	SV
12	*Otus scops*	소쩍새		1	1	0.13	PM
13	*Ninox scutulata*	솔부엉이		1	1	0.13	SV
14	*Alcedo atthis*	물총새	1		1	0.13	Res
15	*Dendrocopos kizuki*	쇠딱다구리	3	2	3	0.38	Res
16	*Dendrocopos major*	오색딱다구리		1	1	0.13	Res
17	*Picus canus*	청딱다구리		1	1	0.13	Res
18	*Motacilla cinerea*	노랑할미새		3	3	0.38	SV
19	*Hypsipetes amaurotis*	직박구리	20	41	41	5.13	Res
20	*Lanius bucephalus*	때까치		1	1	0.13	Res
21	*Phoenicurus auroreus*	딱새	3		3	0.38	Res
22	*Turdus naumanni eunomus*	개똥지빠귀	15		15	1.88	WV
23	*Paradoxornis webbianus*	붉은머리오목눈이	125	83	125	15.64	Res
24	*Regulus regulus*	상모솔새	2		2	0.25	WV
25	*Aegithalos caudatus*	오목눈이	20	6	20	2.50	Res
26	*Parus palustris*	쇠박새	25	11	25	3.13	Res
27	*Parus ater*	진박새	7	1	7	0.88	Res
28	*Parus major*	박새	31	16	31	3.88	Res
29	*Parus varius*	곤줄박이	3	2	3	0.38	Res
30	*Emberiza elegans*	노랑턱멧새	35		35	4.38	Res
31	*Carduelis spinus*	검은머리방울새	2		2	0.25	WV
32	*Coccothraustes coccothraustes*	콩새	7		7	0.88	WV
33	*Passer montanus*	참새	91	32	91	11.39	Res
34	*Oriolus chinensis*	꾀꼬리		14	14	1.75	SV
35	*Garrulus glandarius*	어치	4	3	4	0.50	Res
36	*Pica pica*	까치	101	64	101	12.64	Res
37	*Corvus macrorhynchos*	큰부리까마귀	2		2	0.25	Res
	Number of species		28	24	37		
	Number of individuals		742	337	799		
	Species diversity(H')		2.44	2.31	2.61		

Mig.: Migration, Res: Resident, SV: Summer visitor, WV: Winter visitor, PM: Passage migrant

(2.25) in Seongdusan urban park (B) while the lowest (2.07) in Tandongcheon (A) area. In the case of Tandongcheon (A), the number of species were far larger than the other areas and the ratio of the number of individuals occupied by *Anas crecca* and *Paradoxornis webbianus* was extremely high, which contributed to the fall in overall species diversity. It is remarkable that *Amaurornis phoenicurus* found in the Tandongcheon (A) was the first overwintering individual being observed since it was recorded to have propagated in a reservoir at Dosan-ri Jusaeng-myeon Namwon on June 8, 2001. A repeated observation might be required in this case (Kim *et al*., 2001).

The birds observed in the 2nd phase (May 2009) that was the spring season were 24 species 337 individuals, the highest dominant species of which were *Paradoxornis webbianus* (24.63%), *Pica pica* (18.99%), *Hypsipetes amaurotis* (12.17%), *Anas poecilorhyncha* (10.09%), and *Passer montanus* (9.50%). Except *Anas poecilorhyncha*, most of them belong to forest-dwelling birds (Table 3). With regard to the subject area, the largest number of species (16) were found in Seongdusan urban park (B), while the smallest number (12) was found in Maebongsan urban park (C). The largest number of individuals (173) were found in Tandongcheon (A) area, while the smallest (64) in Maebongsan urban park (C) area. Species diversity was highest as 2.42 in Seongdusan urban park (B) area while lowest as 1.90 in Maebongsan urban park (C) area.

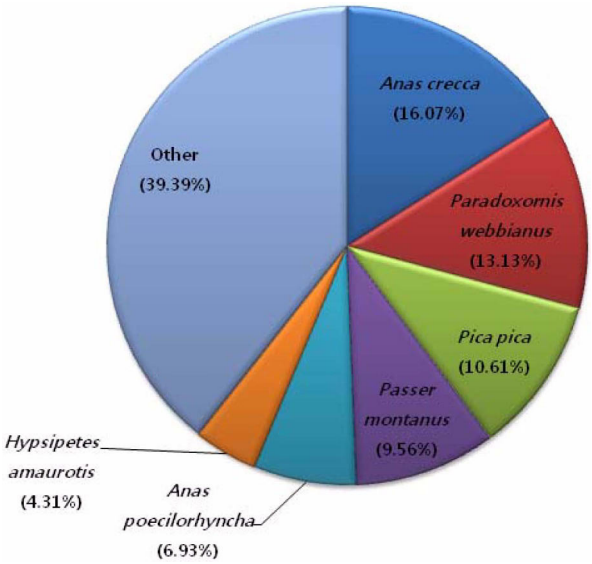

Fig. 2. Comparison of dominant species in Tandong stream

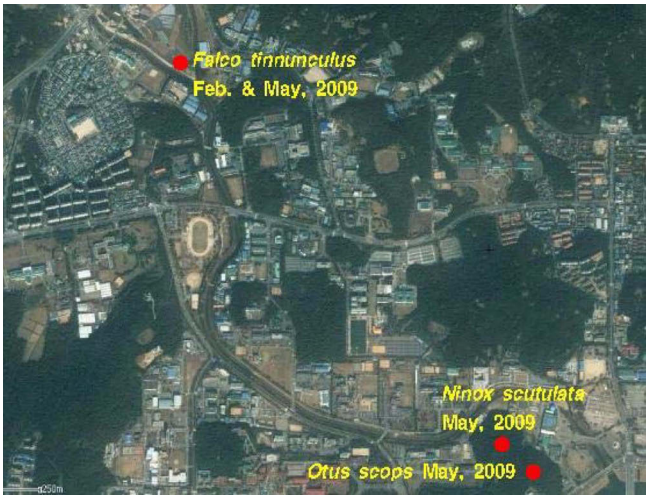

Fig. 3. A distribution chart of legally protected species.

State of legally protected species

The legally protected species observed in the whole region of Tandongcheon were *Falco tinnunculus* (Natural Monument No. 323-8), *Otus scops* (Natural Monument No. 324-6), and *Ninox scutulata* (Natural Monument No. 324-3) (Fig. 3). *Falco tinnunculus* that is the resident bird has been observed on the farm or park near Tandongcheon while *Otus scops* and *Ninox scutulata* that are the winter

Table 2. List of birds observed in winter

No.	Scientific name	Korean name	A	B	C	Total	Dom.(%)
1	*Podiceps ruficollis*	논병아리	2			2	0.27
2	*Egretta garzetta*	쇠백로	2			2	0.27
3	*Anas crecca*	쇠오리	153			153	20.62
4	*Anas platyrhynchos*	청둥오리	15			15	2.02
5	*Anas poecilorhyncha*	흰뺨검둥오리	66			66	8.89
6	*Falco tinnunculus*	황조롱이	1			1	0.13
7	*Phasianus colchicus*	꿩		1		1	0.13
8	*Amaurornis phoenicurus*	흰배뜸부기	1			1	0.13
9	*Streptopelia orientalis*	멧비둘기	4			4	0.54
10	*Alcedo atthis*	물총새	1			1	0.13
11	*Dendrocopos kizuki*	쇠딱다구리		3		3	0.40
12	*Hypsipetes amaurotis*	직박구리	10	1	9	20	2.70
13	*Phoenicurus auroreus*	딱새	3			3	0.40
14	*Turdus naumanni eunomus*	개똥지빠귀	3	12		15	2.02
15	*Paradoxornis webbianus*	붉은머리오목눈이	105	20		125	16.85
16	*Regulus regulus*	상모솔새			2	2	0.27
17	*Aegithalos caudatus*	오목눈이		11	9	20	2.70
18	*Parus palustris*	쇠박새	7	12	6	25	3.37
19	*Parus ater*	진박새		2	5	7	0.94
20	*Parus major*	박새	13	12	6	31	4.18
21	*Parus varius*	곤줄박이		1	2	3	0.40
22	*Emberiza elegans*	노랑턱멧새	2	26	7	35	4.72
23	*Carduelis spinus*	검은머리방울새	2			2	0.27
24	*Coccothraustes coccothraustes*	콩새	7			7	0.94
25	*Passer montanus*	참새	87	4		91	12.26
26	*Garrulus glandarius*	어치		3	1	4	0.54
27	*Pica pica*	까치	81	16	4	101	13.61
28	*Corvus macrorhynchos*	큰부리까마귀	2			2	0.27
	Number of species		21	14	10	28	
	Number of individuals		567	124	51	742	
	Species diversity(H')		2.07	2.25	2.15	2.44	

A: Tandong stream, B: Seongdusan, C: Maebongsan

Table 3. List of birds observed in summer

No.	Scientific name	Korean name	A	B	C	Total	Dom.(%)
1	*Ardea cinerea*	왜가리	1			1	0.30
2	*Anas poecilorhyncha*	흰빰검둥오리	34			34	10.09
3	*Falco tinnunculus*	황조롱이	1			1	0.30
4	*Phasianus colchicus*	꿩	2	6	1	9	2.67
5	*Streptopelia orientalis*	멧비둘기	3	2	1	6	1.78
6	*Cuculus canorus*	뻐꾸기	2		1	3	0.89
7	*Otus scops*	소쩍새		1		1	0.30
8	*Ninox scutulata*	솔부엉이		1		1	0.30
9	*Dendrocopos kizuki*	쇠딱다구리		1	1	2	0.59
10	*Dendrocopos major*	오색딱다구리			1	1	0.30
11	*Picus canus*	청딱다구리		1		1	0.30
12	*Motacilla cinerea*	노랑할미새	3			3	0.89
13	*Hypsipetes amaurotis*	직박구리	13	17	11	41	12.17
14	*Lanius bucephalus*	때까치	1			1	0.30
15	*Paradoxornis webbianus*	붉은머리오목눈이	51	15	17	83	24.63
16	*Aegithalos caudatus*	오목눈이	3	3		6	1.78
17	*Parus palustris*	쇠박새	2	8	1	11	3.26
18	*Parus ater*	진박새			1	1	0.30
19	*Parus major*	박새	2	9	5	16	4.75
20	*Parus varius*	곤줄박이		2		2	0.59
21	*Passer montanus*	참새	22	10		32	9.50
22	*Oriolus chinensis*	꾀꼬리		7	7	14	4.15
23	*Garrulus glandarius*	어치		3		3	0.89
24	*Pica pica*	까치	33	14	17	64	18.99
	Number of species		15	16	12	24	
	Number of individuals		173	100	64	337	
	Species diversity(H')		1.96	2.42	1.90	2.33	

A: Tandong stream, B: Seongdusan, C: Maebongsan

birds were found in Maebongsan and Seongdusan urban parks.

Acknowledgment

This work was supported by the Korea Science and Engineering Foundation (KOSEF) grant funded by the Korea government (MEST) (No.20100002076).

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[Received on April 12, 2010]